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Neuroprotective Potential of Galantamine along with Coenzyme Q10 and Taurine against Aβ (1-42) Induced Cognitive Dysfunction: Involvement of Mitochondrial Dysfunction, Oxidative Damage, Neuroinflammation and Histopathological Alterations

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Taurine, 2-aminoethanesulfonic acid, acts as a neuromodulator, prevent mitochondrial dysfunction, apoptosis and oxidative stress. Coenzyme Q 10 (CoQ10), a lipophilic, endogenous, vitamin-like antioxidant compound. Galantamine, acetylcholinesterase inhibitors (AChEIs), is a novel treatment for AD and modulates nicotinic acetylcholine receptors (nAChRs). We aimed to evaluate the neuroprotective potential of taurine and CoQ10 along with galantamine in Aβ (1-42) induced cognitive dysfunction in rats. Intrahippocampal (*i.h.*) Aβ (1-42) (1μg/μl; 4μl/site) were administered, followed by drug treatment with taurine (25 and 50 mg/kg), CoQ10 (10 and 20 mg/kg), galantamine (2 mg/kg) and their combinations for a period of 21 days. Various neurobehavioral parameters followed by biochemical, AChEs level, mitochondrial enzyme complex level (I-IV), TNF-α level and histopathological alterations were assessed. Aβ (1-42) administration significantly impaired cognitive performance in Morris water maze (MWM) test, causes oxidative stress, raised AChEs level, neuroinflammation, mitochondrial dysfunction and histopathological alterations as compared to the sham treatment. Treatment with taurine (25 and 50 mg/kg), CoQ10 (10 and 20 mg/kg) and galantamine (2 mg/kg) improved cognitive performance in MWM test, reduced AChEs activity, neuroinflammation, oxidative damage, TNF-α level, restored mitochondrial respiratory enzyme complex (I-IV) activities and histopathological alterations as compared to Aβ (1-42) treated animals. Further, combinations of taurine (25 and 50 mg/kg) and CoQ10 (10 and 20 mg/kg) and their interaction with galantamine (2 mg/kg) significantly (P<0.05) modulate the neuroprotective potential of galantamine (2 mg/kg) as compared to their effect *per se* in Aβ (1-42) treated animals. The present study suggests the neuropotentiating effect of taurine and CoQ10 on galantamine in Aβ (1-42) treated animals.

Keywords: Alzheimer's disease, Aβ (1-42), CoQ10, taurine, galantamine, mitochondrial dysfunction, oxidative stress, neuroinflammation.